Implementation strategies for genomic selection in Norwegian White Sheep

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Forskningsrådet

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Aim

- Identify the most promising implementation strategy for genomic selection in Norwegian White sheep
- Predict the change in genetic gain that can be achieved by this strategy

The current breeding scheme

3 groups of traits:
- Growth
- Slaughter
- Maternal

~70 000 male lambs born

Growth Pedigree

Selection

1 year

1 500 young ram

Selection

Offspring: Growth (60) Slaughter (25)

2 years

300 elite rams

Selection

Offspring: Growth (60) Slaughter (50)

3 years

20 AI rams

Offspring records for maternal traits

Need for revised breeding scheme

- Main reason:
  - Maternal traits need to be improved
- Secondary objective:
  - Increase total genetic gain

Tested alternative implementation strategies by stochastic simulations

Alternative future breeding schemes

3 groups of traits:
- Growth
- Slaughter
- Maternal

~70 000 male lambs born

Selection

1 year

1 500 young rams

Selection

2 years

300 elite rams

Genomic selection

Selection

3 years

20 AI rams

Alternative future breeding schemes

3 groups of traits:
- Growth
- Slaughter
- Maternal

~70 000 male lambs born

Selection

1 year

1 500 young rams

Genomic selection

2 years

20 AI rams

2 years

300 elite rams

Alternative future breeding schemes

3 groups of traits:
- Growth
- Slaughter
- Maternal

40 AI rams

Genomic selection

Selection

~70 000 male lambs born

1 year

1 500 young rams

Selection

2 years

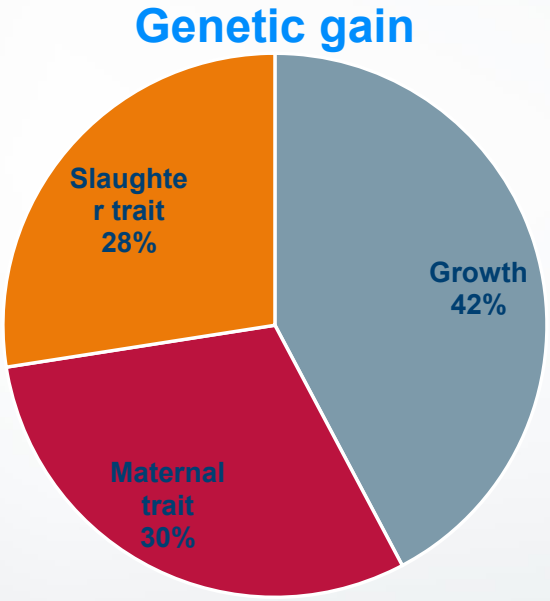
300 elite rams

Trait parameters

	Heritability	Weight in the breeding goal
Growth	0.1	30 %
Slaughter trait	0.25	20 %
Maternal trait	0.05	50 %

Correlation (genetic and phenotypic)between growth and slaughter trait was -0.2

Results from the current breeding scheme

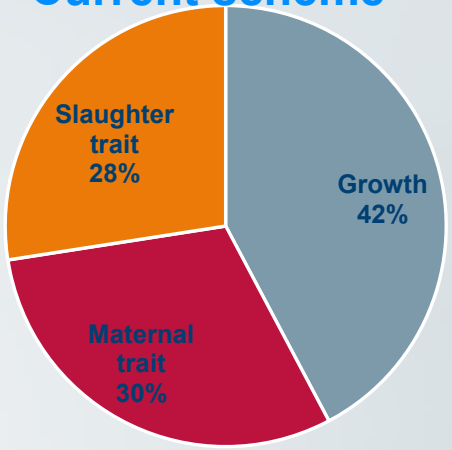


Rate of inbreeding per year: 0.3 %

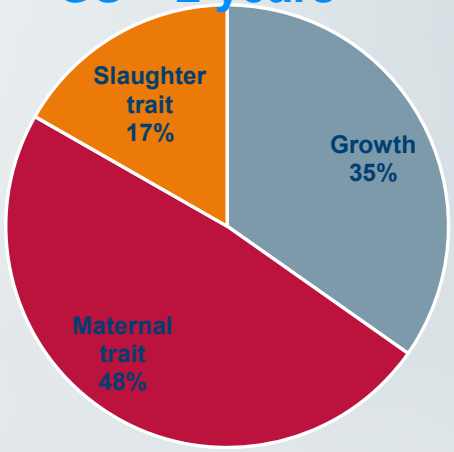
Genetic gain

Scheme	Change Maternal trait	Change total genetic gain
GS – 3 years – 300	+ 16 %	- 9 %
GS – 3 years – 1500	+ 29 %	0
GS – 2 years	+ 65 %	+ 18 %
GS – 1 year	+ 69 %	+ 31 %

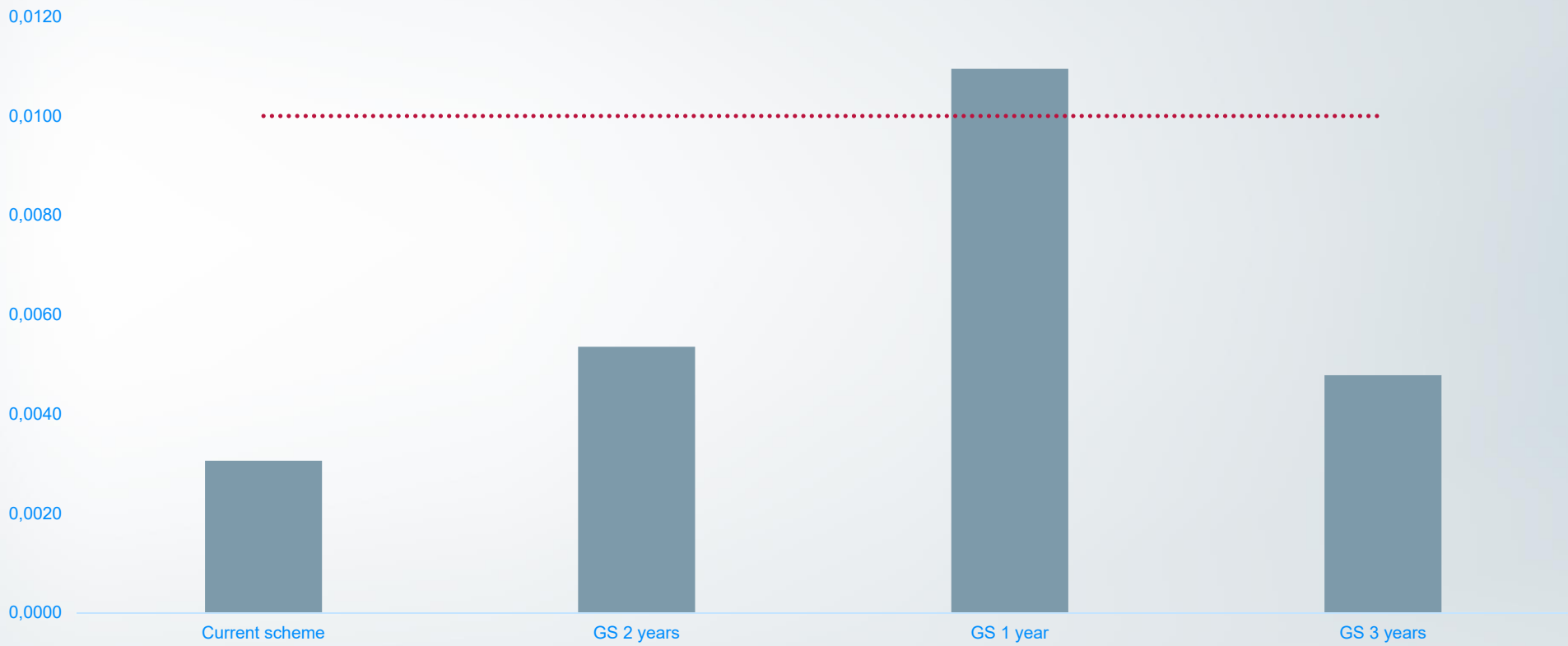
Current scheme



GS – 2 years



Rate of inbreeding per year



Conclusions

- The optimal implementation of genomic selection is to genotype all test rams and select AI rams one year earlier than today, causing a generation interval of 2 years for the AI rams

- Implementation of genomic selection could:
  - Increase genetic gain for maternal traits by 65 %
  - Increase total genetic gain by 18 %
  - Cause genetic gain for each trait to be in concordance with the breeding goal